



## **Role of Clp proteolytic complex in stress response of *Campylobacter jejuni***

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# **BIOTRACER**

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# Role of Clp proteolytic complex in stress response of *Campylobacter jejuni*

Małgorzata Ligowska, Marianne Thorup Cohn and Lone Brøndsted

*Campylobacter jejuni* is a Gram-negative pathogen, recognized as the leading cause of bacterial foodborne infection in humans worldwide. It is a spiral-shaped, motile, microaerophilic bacterium that colonizes chicken intestine.

Similarly to other pathogens, it owes its ability to survive stress in the environment to various molecular mechanisms as well as physiological adaptation.

The Clp proteolytic complex is one of the mechanisms that allow *Campylobacter jejuni* to survive at various unfavourable conditions present inside, as well as outside of the host. It is responsible for degradation of misfolded proteins, which in turn prevents the formation of protein aggregates in the cell.

It was shown by Cohn *et al.* (2007) that in *C. jejuni*, ClpX and ClpP proteins are responsible for degradation of heat-damaged proteins and that ClpX and ClpP are required for growth at 42 and 44°C.

We will now further investigate the role of the Clp proteolytic complex in survival of *C. jejuni* under different stress conditions encountered by this bacterium in the environment and in the host.

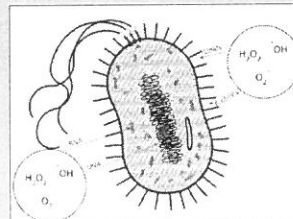
*C. jejuni* strains with mutations in genes *clpP*, *clpX*, *clpA* and *clpS* will be tested for growth and survival in the conditions mentioned above, both *in vitro* and using different food models.

## Clp PROTEASES ARE IMPORTANT FOR BACTERIA



- Involved in general and regulatory proteolysis
- Important for virulence and stress tolerance in many pathogens
- Their specificity may be modified by an adaptor protein

## ROLE OF CLP PROTEINS IN OXIDATIVE STRESS



Oxygen stress is the main type of stress encountered by *Campylobacter* during the poultry processing chain. Strains are exposed to atmospheric oxygen immediately after evisceration of a chicken in a slaughter house.

Exposure to oxidative stress leads to many, often irreversible, alterations in bacterial proteins. Clp proteases can therefore play a major role in response to this type of stress.

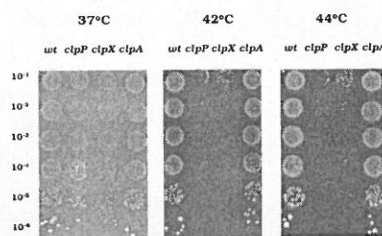
### We will test:

- Survival of mutants after exposure to different oxidative agents
  - Hydrogen peroxide
  - Cumene hydroperoxide
  - Methyl viologen
- Survival of mutants after exposure to atmospheric oxygen

We will also investigate types of protein modifications that can occur in *Campylobacter* during oxidative stress and the specific mechanisms, by which Clp proteases could act on these modified proteins.

## GROWTH OF *clp* MUTANTS AT DIFFERENT TEMPERATURES

### ClpX and ClpP are required for growth at 42 and 44°C



Cohn *et al.* 2007

Cohn *et al.* (2007) observed that mutants lacking *clpX* or *clpP* gene were growing much poorer than the wild type at high temperatures (42°C and 44°C), suggesting that ClpX and ClpP are required for growth of *C. jejuni* at these temperatures. A ClpA mutant, however, could grow just as well as the wild type.

## *clp* GENES IN *C. jejuni* ARE EXPRESSED IN OPERONS

